SECTION 96

STORAGE BATTERIES

96.1 REFERENCE

(96A) Code of Federal Regulations - 46 CFR Sub-chapter J

(96B) USCG NVIC 2-89 - *Guide for Electrical Installations on Merchant Vessels and Mobile Offshore Drilling Units*

96.2 INTRODUCTION

This Section contains the Contractor Design and Provide general storage battery requirements for those systems and equipment that require battery power for normal or emergency operation.

For WSF Fleet-wide Standardization purposes, End No. 1 of the Vessel shall always be considered the bow, and this designation shall delineate port and starboard, fore and aft wherever they are addressed in the Technical Specification.

96.3 GENERAL

Design and provide battery banks for the Propulsion Control Systems Interior Communications System, Emergency Diesel Starting System, Pilothouse Distribution System, VHF radio systems, and Rescue Boat Motor Starting System, including battery boxes or storage racks, interconnecting wiring, fused disconnect switches, circuit breaker, battery chargers, power supplies, local and remote reading instrumentation, and other items and devices as are required to comply with 46 CFR §111 and 46 CFR §112 and to make complete, functional, and fully operational battery systems as required herein and by the Authoritative Agencies. Install vendor furnished control, auxiliary alarm, and monitoring system batteries, power supplies and distribution systems.

Power supply and battery charger sizes and ampere-hour ratings of batteries given in this Section of the Technical Specification are estimates. The Contractor shall determine the actual required battery capacities and battery charger ratings for the intended applications, but in no case shall the capacity of the batteries or ratings of the battery chargers and power supplies be less than those specified herein. Standard IEEE battery sizing procedures shall be used in sizing batteries. Each battery charger shall be fitted with a regulated constant voltage automatic float charger, sized to maintain fully charged batteries and carry full load. All battery chargers shall be UL-1236 Marine approved, or be UL-1536 approved (Industrial Chargers) and also meet the Marine Supplement of UL-1236 as described in Reference (96B), Chapter 3.4. All power supplies shall be UL-1012 approved.

All batteries, except radio batteries and Rescue Boat batteries, shall have remote displays on the Ship's Service Switchboard and Owner Furnished Equipment (OFE) Alarm and Monitoring System (AMS) showing battery voltage. OFE ground indication instrumentation shall also provide inputs into the OFE Alarm and Monitoring System.

All batteries shall have "flag" or "chair" type, bolted marine connection posts. Round or threaded posts **shall not** be used.

For cable installation, identification and termination, see Section 87 of the Technical Specification.

96.4 INTERIOR COMMUNICATIONS BATTERIES

Design and provide a 24 volt battery system for operation of the Vessel's General Alarm System, "FR" shutdown circuits, fire release door magnetic holdback mechanisms, and other systems pertinent to the Contractor's design. The system shall utilize 12 volt, Class 8D batteries, connected in series and parallel to provide 24 Vdc, with sufficient capacity to power the loads of all general alarm audible and visual indicators, and other loads determined from system design. Provide batteries, disconnect switches, battery charger, distribution panels, circuit breakers, fuses and wiring necessary for a complete functional and operational system. Batteries shall be located in a dedicated ventilated Electrical Distribution Room No. 10 on the Lower Vehicle Deck, starboard with ample room for

maintenance and removal. See Section 95 of the Technical Specification for additional discussion. The battery charger shall be a SENS (Stored Energy Systems) NRG, or equal, sized in accordance with system design, with dry contacts for battery charger failure inputs to the OFE Alarm and Monitoring System. The battery charger shall be capable of high accuracy (±0.5%) line and load regulation, temperature compensated, with digital metering of amps and volts. The charger shall contain a regulated power supply capable of maintaining the system voltage and amperage with the battery disconnected from the circuit. Input power to the battery charger shall be from the final Emergency Power source. Locate the battery chargers in the Electrical Distribution Room No. 10.

For WSF Fleet-wide Standardization purposes, the distribution panel shall be a SQUARE D NQOD panelboard utilizing NQO double pole circuit breakers. Locate the distribution panels in the same area as the battery charger. Provide ground indicating lights and test pushbutton in the face of the panel. See Section 90 of the Technical Specification for additional discussion.

Interior Communications battery voltage shall be monitored at the Ship's Service Switchboard. See Section 89 of the Technical Specification for more discussion.

OFE ground detection instrumentation shall be provided for inputs into the OFE Alarm and Monitoring System.

96.5 PROPULSION CONTROL BATTERIES

Install batteries, battery racks, power supplies, disconnects, and other components as required by all propulsion control and propulsion machinery vendors. There shall be two (2) independent 24 Vdc redundant battery systems, each with its own batteries, battery chargers, disconnect switches, and distribution panels. Provide all cables as required. The installation and electrical connections shall satisfy the requirements of the USCG and vendor specifications. The battery bank shall be sized to maintain control, normal and vital monitoring, logging and alarm functions for at least sixty (60) minutes with the battery charger inoperable. Additional discussions are contained in Section 99 of the Technical Specification.

The Propulsion Control batteries shall supply two (2) 24 Vdc power sources for the Propulsion Control PLCs, Alarm and Monitoring PLCs, Switchboard PLCs, Main Engine electronic governors, auxiliary engine electronic governors, Tank Level Indicator PLCs, and other functions as determined by Contractor's design. Power steering diodes, CRYDOM, or equal, shall be utilized at PLC compartments to select the "best available" source of power.

Provide 12 volt, Class 8D batteries, connected in series and parallel to provide 24 Vdc, for each of the Propulsion Control battery systems. Locate the Propulsion Control battery banks in the Electrical Distribution Room No. 10 as set forth in the *INTERIOR COMMUNICATIONS BATTERIES* Subsection in this Section of the Technical Specification.

Each battery bank shall be charged by a STORED ENERGY SYSTEMS (SENS) NRG, or equal, battery charger, with dry contact battery charger failure inputs to the OFE Alarm and Monitoring System. The battery charger shall be capable of high accuracy (±0.5%) line and load regulation, temperature compensated, with digital metering of amps and volts. The charger shall contain a regulated power supply capable of maintaining the system voltage and amperage with the battery disconnected from the circuit. Primary voltage for one (1) battery bank shall be supplied from the Final Emergency Power source. The input power to the remaining battery source shall be from the Ship's Service Bus. Locate the battery chargers in an adjacent Electrical Distribution Room No. 10 as set forth in the *INTERIOR COMMUNICATIONS BATTERIES* Subsection in this Section of the Technical Specification.

For WSF Fleet-wide Standardization purposes, the distribution panel shall be a SQUARE D NQOD panelboard utilizing NQO double pole circuit breakers. Provide ground indicating lights and test pushbutton in the face of the panel. Locate these panels in the EOS Control Room. See Section 90 of the Technical Specification for additional discussion.

Propulsion Control battery voltage shall be monitored at the Ship's Service Switchboard and the OFE Alarm and Monitoring System. See Section 89 of the Technical Specification for more discussions.

OFE ground detection instrumentation shall be provided for inputs into the OFE Alarm and Monitoring System.

96.6 EMERGENCY GENERATOR STARTING BATTERY

Provide 12 volt, Class 8D batteries, connected in series and parallel to provide 24 Vdc for the Emergency Diesel Generator starting system. Batteries shall be sized to provide adequate capacity to meet U.S. Coast Guard engine cranking requirements in compliance with 46 CFR §112. Provide a battery box which complies with 46 CFR §111 and locate the battery in the Emergency Diesel Generator Room. See Section 89 of the Technical Specification for further discussion of the Emergency Generator starting system.

Provide a 24 Vdc STORED ENERGY SYSTEMS (SENS) NRG or equal, battery charger for charging the Emergency Diesel Generator starting batteries and locate it in the Emergency Diesel Generator Room on the bulkhead near, but not over, the starting battery. The battery charger shall be capable of high accuracy (±0.5%) line and load regulation, temperature compensated, with digital metering of amps and volts. The charger shall contain a regulated power supply capable of maintaining the system voltage and amperage with the battery disconnected from the circuit. The battery charger shall be powered from single-phase 208 Vac final emergency power. The complete installation shall satisfy the requirements of 46 CFR §111 and 46 CFR §112.

Provide a distribution panel in the Emergency Diesel Generator Room for distribution of 24 Vdc. For WSF Fleet-wide Standardization purposes, the distribution panel shall be a SQUARE D NQOD panel board utilizing NQO double pole circuit breakers. Provide

ground indicating lights and test pushbutton in the face of the panel. See Section 90 of the Technical Specification for additional discussion.

Emergency Generator Starting battery voltage shall be monitored at the Ship's Service Switchboard and the OFE Alarm and monitoring System. See Section 89 of the Technical Specification for more discussion.

OFE ground detection instrumentation shall be provided for inputs into the OFE Alarm and Monitoring System.

96.7 PILOTHOUSE 24 VDC DISTRIBUTION SYSTEM

Provide 12 Volt, Class 8D batteries, connected in series and parallel to provide two (2) 24 Vdc sources for the Pilothouse 24 Vdc Distribution System. Locate one (1) battery bank each in No. 1 and No. 2 Sun Deck Electrical Distribution Rooms. Provide battery boxes that comply with 46 CFR §111.

Provide two (2) 24 Vdc, SENS (Stored Energy Systems) NRG or equal, battery chargers for charging the battery banks. The battery charger shall be capable of high accuracy (±0.5%) line and load regulation, temperature compensated, with digital metering of amps and volts. The charger shall contain a regulated power supply capable of maintaining the system voltage and amperage with the battery disconnected from the circuit. These shall be powered from the Final Emergency Power System. Provide fused disconnect switches and wiring to connect the batteries to the 24 Vdc Power Distribution Panels mounted in each Pilothouse. The battery charger installations and electrical connections shall satisfy the requirements of 46 CFR §112.

For WSF Fleet-wide Standardization purposes, the distribution panel shall be a SQUARE D NQOD panelboard utilizing NQO double pole circuit breakers. Provide ground indicating lights and test pushbutton in the face of the panel. See Section 90 of the Technical Specification for additional discussions.

Pilothouse Distribution battery voltage shall be monitored at the Ship's Service Switchboard and the Alarm and Monitoring System. See Section 89 of the Technical Specification for more discussion.

OFE ground detection instrumentation shall be provided for inputs into the OFE Alarm and Monitoring System.

96.8 RADIO COMMUNICATIONS

Provide a 12 Vdc VHF Radio battery adjacent to each Pilothouse on each End of the Vessel. These batteries shall be Standard Battery Type RV-12, with bolt through terminals. Provide a fiberglass weatherproof battery box located above the Crews quarters and adjacent to the mast immediately behind the associated Pilothouse.

For WSF Fleet-wide Standardization purposes, provide a NEWMAR MODEL 11-12-20A power supply for charging each of the radio batteries. See Section 93 of the Technical Specification for other information regarding power supplies.

Provide wiring to the Owner Furnished Equipment (OFE) VHF Radio Power Distribution Panel located in the corresponding Pilothouse and to OFE radios mounted on the control console and adjacent areas.

96.9 RESCUE BOAT BATTERIES

Provide 12 Vdc Rescue Boat starting batteries, battery charger, disconnect switch with pilot light, female plug and associated wiring, and connection boxes to make a complete functional starting system for each Rescue Boat.

Provide a SENS NRG, battery charger for each Rescue Boat Station. The battery charger shall be capable of high accuracy (±0.5%) line and load regulation, temperature compensated, with digital metering of amps and volts. The charger shall contain a regulated power supply capable of maintaining the system voltage and amperage with the battery disconnected from the circuit. The primary input to the battery charger shall be from the Final Emergency Power source.

For WSF Fleet-wide Standardization purposes, provide portable cable and DANIEL WOODHEAD MODEL 25W04MB female plug and cover to make up to the male connection on the Rescue Boat for charging the battery.

96.10 SPARE PARTS AND INSTRUCTION MANUALS

Provide a list of recommended spare parts and special tools for those items which are Contractor furnished together with parts lists and instruction manuals necessary to maintain and service provided equipment and accessories in accordance with the requirements of Sections 86 and 100 of the Technical Specification.

96.11 TESTS, TRIALS AND INSPECTIONS

Tests and/or trials shall be in accordance with this Section and Section 101 of the Technical Specification.

Inspections shall be performed as defined in this Section and Section 1 of the Technical Specification.

96.12 PHASE II TECHNICAL PROPOSAL REQUIREMENTS

The deliverables required by Section 100 of the Technical Specification and the Authoritative Agencies, shall be submitted during the Phase II Technical Proposal stage of Work in accordance with the requirements of Section 100 of the Technical Specification.

See Section 100 of the Technical Specification for additional requirements regarding technical documentation.

96.13 PHASE III DESIGN DETAIL AND CONSTRUCTION REQUIREMENTS

The following calculations, in addition to other deliverables required by Section 100 of the Technical Specification and the Authoritative Agencies, shall be submitted during the Phase III Detail Design stage of Work in accordance with the requirements of Section 100 of the Technical Specification:

A. Battery and Charger Capacity & Uninterruptible Power Supply Calculations

The ***Battery Calculations*** shall identify the voltage and provide ampere-hour capacity calculations for each battery system to be provided.

See Section 100 of the Technical Specification for additional requirements regarding technical documentation.

(END OF SECTION)